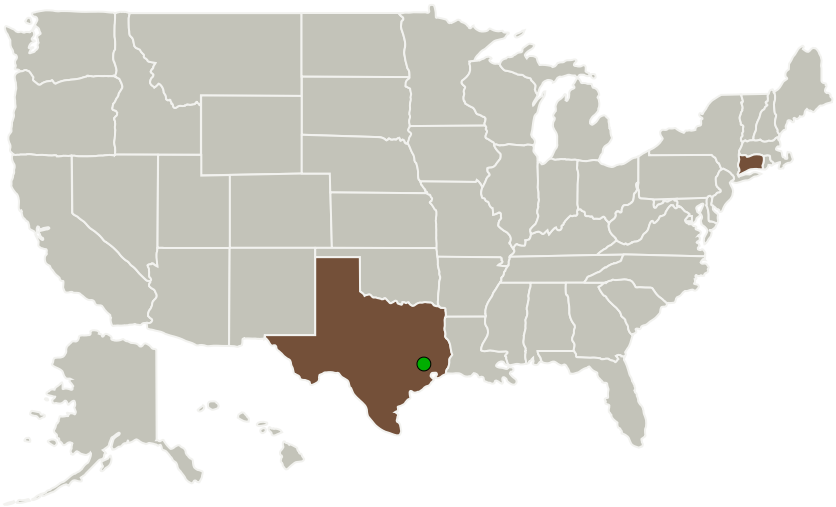
6 CFM Electrochemical Hydrogen Pump and Compressor, Phase II

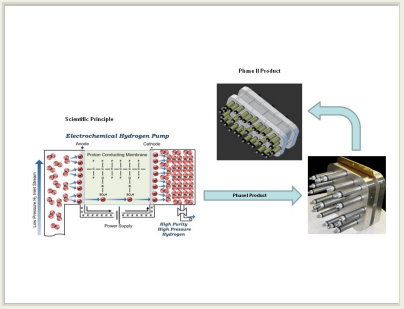
Completed Technology Project (2012 - 2015)

Project Introduction

Hydrogen is an essential resource for space missions. NASA has a need for equipment to generate, handle and store hydrogen. In terms of handling hydrogen, conventional rotating mechanical pumps and compressors require extensive modification and have limited reliability. Electrochemical pumping and compression of hydrogen occurs without any moving parts and is highly reliable and efficient. Sustainable Innovations has demonstrated up to 6,000 psi of compression using electrochemical cell hardware. However, for high flow applications, such as a 6 CFM hydrogen pump for NASA, a departure from traditional electrochemical cell hardware designs is needed. Our work in Phase I demonstrated an Expandable Modular Architecture cell design, that allows a large footprint for the electrochemical stack. This is achieved using modular cell parts to create large active area cells. The modular parts are inexpensive to manufacture and can achieve the high tolerances need for large active area cells. The proposed Phase II activity will leverage the key developments in Phase I and demonstate the scalability of this device for critical NASA and commercial applications. This will include increasing the active area/capacity of the electrochemical cell stack by a factor of 5, and to increase pressure capability from 200 psi to 750 psi. The resultant unit will be utilized to actuate pneumatic tools that could be used in space.

Primary U.S. Work Locations and Key Partners





6 CFM Electrochemical Hydrogen Pump and Compressor Project Image

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Organizations Performing Work	Role	Type	Location
Sustainable Innovations, LLC	Lead Organization	Industry	East Hartford, Connecticut
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Skyre Inc	Supporting Organization	Industry Small Disadvantaged Business (SDB)	

Primary U.S. Work Locations	
Connecticut	Texas

Project Transitions

April 2012: Project Start

January 2015: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137393)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sustainable Innovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Trent Molter

Co-Investigator:

Trent Molter

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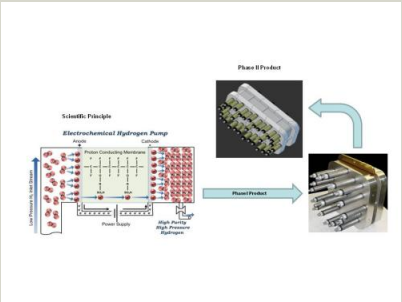
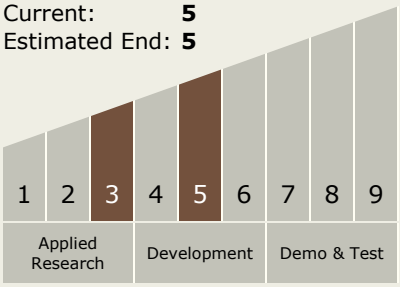
Images



Project Image
6 CFM Electrochemical Hydrogen Pump and Compressor Project Image
(https://techport.nasa.gov/image/127337)

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.4 Resource Processing for Production of Manufacturing, Construction, and Energy Storage Feedstock Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System